UCD IMPROVE Technical Information #251C

Filter Inventory and Acceptance

Interagency Monitoring of Protected Visual Environments
Air Quality Research Center
University of California, Davis

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DOCUMENT HISTORY

Date Modified	Initials	Section/s Modified	Brief Description of Modifications
05/04/2020	GRM	All	Updated wording & formatting.
03/04/2021	TAK	All	Updated balance QC and general procedures to include weighing in the MTL AH500 Autohandler. Updated wording for filter acceptance.
04/12/2021	GRM	All	Updated wording to accommodate for secondary AH500 unit & move to Drew Ave.
01/31/2022	SRS	All	Previous anthologized version separated into individual TIs.
3/17/2022	GRM	ALL	Updated wording to accommodate new procedures.
4/18/2022	GRM	Section 7 & 8	Added Data and Records Management & Quality Assurance and Quality Controls sections

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1.   PURPOSE AND APPLICABILITY

The purpose of this TI is to describe the process of acceptance testing and inventorying for the PTFE, nylon, and quartz filters. The procedures described apply to all filters used for IMPROVE sampling network.

2.   SUMMARY OF THE METHOD

PTFE and nylon filters undergo preliminary testing before lots are delivered. When lots are delivered, acceptance testing is performed before the filters are cleared to be loaded and sent out into the field. Quartz testing is done by the quartz contractor before being sent to the sample handling group. All filter types have inventory sheets that are used to track usage and to estimate when a new lot must be ordered.

3.   CAUTIONS

Be sure to track filter inventory carefully and to order filter shipments well in advance (six months or more) to accommodate any delays in the delivery process.

Be very careful when performing acceptance testing and interpreting results. The quality of the filters is important to sampling and analysis.

4.   PERSONNEL QUALIFICATIONS

Lead laboratory technicians, laboratory managers, or principal investigators (PI) can carry out filter acceptance and inventory procedures. Lead lab assistants must be trained by the lab manager or another lab assistant familiar with the procedures before performing these tasks.

5.   EQUIPMENT AND SUPPLIES

See individual sections for detailed equipment lists for the tasks involved in filter acceptance and inventory.

6.   PROCEDURAL STEPS

6.1   PTFE Filters

6.1.1   Receiving a PTFE Filter Lot

Shipments of PTFE filters are sent with an invoice and a packing slip and that can range from several boxes of filters to as many as 1100 boxes (enough for a year). Test lot shipments will usually contain a small number of filters, while approved lot shipments will usually contain the full number of filters used for the year. Sometimes lot shipments are split and sent within a day or two of each

other. When filters are received, count the number of boxes and/or filters present to verify the packing slip. Sign and date the packing slip and give it to the AQRC employee in charge of accounting.

The received PTFE filter boxes are placed in a large container (e.g., Bankers box) and stored by the MTL Autohandler Chambers if space allows.

6.1.2   PTFE Filter Inventory

The PTFE filter inventory files are located in: "U:\IMPROVE_Lab\Lab Gravimetric\Filter Inventory and Acceptance. There is a separate folder for each year. Within each yearly folder are separate Excel files for nylon, quartz, and PTFE filters.

Each Excel file contains numerous spreadsheets for logging in sets of boxes of filters.

These sheets are created when a shipment of filters arrives and are completed as filters are used. The lab staff updates the excel sheet with entries as the filters are used.

There is also a "RATE LOG" sheet that keeps track of filter usage and provides an estimated depletion date for the filters on hand. The PTFE files also include "LABELS" sheets that are used to create and print labels to be affixed to each box of filters if applicable.

PTFE filters come in large shipments, typically around a year's supply. A new set of log sheets and labels to affix to each box of filters need to be created for each new shipment.

Copy the most recent Excel file for the PTFE filters and rename it with the date of receipt of the shipment. Some cutting and pasting is needed to create the new file, and enough sheets must be created within the file to accommodate the size of the new shipment.

1)   Highlight all sheets of interest (sheets beginning with "SHEET") holding **Shift** and selecting the first and then last sheet. Viewing any of the selected sheets, select all fields from (J8) to (K32) and press **Delete**. This same change should be reflected on all sheets, deleting any pre-filled "INITIALS" and "DATE" entries.

2)   Note the Part Number on a box of filters, following "P/N." The filter diameter, 25 mm, should not change.

3)   Note the Lot Number on a box of filters. The lot number is typically the same for every box in the shipment.

4)   Note the day these filters were received.

5)   Select the **INPUT DATA** sheet and fill in the Part Number, Lot #, and Received Date(s).

6)   Confirm on the box that the REMOVAL is 3.0 μm and the Size is 25 mm.

The Box # is determined by the box numbers assigned by MTL. The last three numbers on the labels become IMPROVE's internal pack (or box) numbers. List the box numbers consecutively in the Box # column of the spreadsheet, 25 to a page. The Box # for PALL shipments starts at 1 and follows through chronologically. The next column to the left, "Quantity," lists the number of filters in a box. This number is typically 100 for PTFE filters. However, some filters are removed from a few boxes for acceptance testing or other tests, so modify the numbers in those cells to reflect the actual number of filters in each box. Note this by inserting a comment (right-click **Insert Comment**) for that field. The PTFE spreadsheet has a "SHIPMENT" column, which is usually "1" unless the order is split or delivered in separate shipments.

A few filters selected from each new lot will need to undergo acceptance testing. Work with the laboratory manager to select these filters and to arrange for laboratory analysis.

The PTFE Excel file contains a "RATE LOG" sheet. This sheet keeps track of the filter usage versus the inventory available and, based on the average rate of usage, predicts when the current lot will run out. Edit the "RATE LOG" sheet as needed to contain the same number of rows as the number of spreadsheets in the shipment. Note that columns C ("PACKAGES") through G ("COMPLETED") are populated by links to the individual spreadsheets. When a new "RATE LOG" sheet is created, review it carefully to make sure the links are pointing to the proper sheets based on "SHIPMENT" and "SET" listed in columns A and B. Referring to the summary formulas at the bottom of the spreadsheet, the "TOTAL" summation should include all the rows of the table, as it shows the total beginning inventory. The "FIL USED" and "AVG" formulas include only the rows associated with the filters used to date, as will be explained further below. Ignore columns to the right of column H.

The laboratory staff will complete an entry on the excel sheet each time a box of filters is used. Enter the initials and date into each cell on the appropriate sheet.

Once an entire log sheet has been populated proceed to the "RATE LOG" sheet. In cell H3, enter the date on which the log sheet was completed. Check the last completed row in the "RATE LOG" sheet to verify that it corresponds to the log sheet being entered (that row will have been completed by its links to the log sheet). Then go to the formulas at the bottom of the spreadsheet. In both "FIL USED" and "AVG," change the second cell within the formula parentheses to indicate the row of the log sheet being added. If a single log sheet is being added, this will involve augmenting the formula by one row (for example, changing (D6:D17) to (D6:D18)).

Now that all of the data is entered, check the depletion date shown in yellow at the bottom of column H. This date is the estimate of when the inventory will run out based on average usage.

6.1.3   PTFE Filter Acceptance Testing

Consistency in flow rate and composition (i.e., no contamination) are primary requirements for PTFE filters being used in the IMPROVE network.

Generally, a small number of filters are received for pre-delivery testing. Approximately 10% of the filters are analyzed by XRF for composition. This number will vary depending on the availability of the XRF instruments and the Laboratory Manager. Another eleven filters from each box are tested for flow changes. When certified, the entire lot is authorized for use in network operations. Acceptance testing is performed again when the filter lot is delivered before they are cleared to go out into the field. The following sections apply to the preparation and analysis of both new test lots of filters and filters that have been pre-approved. Items that apply specifically to only one or the other are noted.

6.1.3.1 PTFE Analysis

Approximately 10% of the pre-delivery filters are analyzed by X-ray fluorescence (XRF) to verify that there are no abnormal artifacts. This number will vary depending on the availability of the XRF instruments and the Laboratory Manager. Once the filters have been analyzed, the average net intensities (cps/mA) and standard deviations are determined for each species. The results of these filters are compared with both the results from the testing of the lot currently in use. If the measured net intensities (cps/mA) for the two lots are within the set acceptance limit—which is the average bilateral +/- 3 standard deviations of measured net intensities—then the filters are accepted for full delivery. If an outlier or irregularity is observed from visual inspection of the filters and/or the results of the XRF, the laboratory manager is informed.

Once the shipment of the new lot has been received, 0.3% to 0.4% of the filters (randomly chosen) are analyzed by XRF for final check. This number will vary depending on the availability of the XRF instruments and the Laboratory Manager. The results of these filters should meet the same acceptance limits set for the pre-delivery box. All results and comparisons should then be forwarded to the laboratory manager for a final decision about acceptance or rejection of the specific lot of filters.

6.1.3.2 Special Tests for New PTFE Test Lots

Once a test lot is shown to have no significant contamination, a test to examine flow change must be performed.

6.1.3.3 Flow Change Test

A flow change test is done to simulate the change in flow rate that should be expected when the new filter lot is installed in samplers that were calibrated using filters from the current filter lot. A significant change in the flow rate must

be avoided as it may result in invalid data.

1) Supplies needed:

- Three IMPROVE PM$_{2.5}$ cartridges
- Twenty-two PTFE filters from the test lot (11 per box for preliminary testing)
- Twelve PTFE filters from the current lot
- Forceps with ceramic tips
- DryCal® device
- Worksheet and pen
- Arbor press
- Tygon® tubing with DryCal® fitting on one end and T-plug on other
- Top plug from audit kit
- One sampling unit, complete with one controller and one PM$_{2.5}$ module in the IMPROVE shop

2) Carefully load a current-lot filter into each cassette in all three cartridges, being sure all parts are assembled properly.

3) Copy last year's filter acceptance worksheet. It should be located in: U:\IMPROVE_Lab\Lab Gravimetric\Filter Inventory and Acceptance\Filter Acceptance. Rename the file to indicate the current year (and set, if applicable). Delete the entries and save the file. Print out the now blank worksheet.

4) Bring the Tygon® tubing with fittings and probe attached, plug from an audit kit, worksheet, and cartridges to the IMPROVE shop.

5) Confirm that the controller in the IMPROVE shop delivers stable data.

6) Attach the Tygon® tubing to the DryCal® using the DryCal® fitting. Tighten the fitting by hand first, and then use a wrench for ¼ of a turn to make sure the fitting is tight. Use the plug from an audit kit to block the top of the T-plug in the module. Insert the probe (attached to the Tygon® tubing) into the bottom of the T-plug in the module.

7) Put the first cartridge into the module. Plug in the controller and enter calibration mode. Go to position 1 of the module being used.

8) Turn the DryCal® on. Write down the pressure value displayed on the DryCal® onto the worksheet. Select **Measure** and then press **Enter**.

9) Calibrate using the first position cassette of the first cartridge. Do this by selecting **Continuous** mode on the DryCal® and press **Enter**. The DryCal® will take continuous measurements and will display a running average for the measurements up until the 10th consecutive measurement. Then, the running average resets.

10) While the continuous measurements are taken by the DryCal®, turn the

black knob on the valve behind the cyclone until the values on the DryCal® read approximately 23 lpm. Once it reads about 23 lpm, press **Enter** to pause. Then, select **Burst**. The DryCal® will take 10 measurements. If the average value is within ± 0.01 from 23 lpm, write down the value. Make sure to also record the temperature. If the average value is outside the acceptable range, repeat this step.

11) Run through the rest of the positions in the cartridge using the **Burst** option. Record the readings for each filter, making sure to also note the time and temperature for each reading.

12) After all filters have been measured, choose the filter with the median reading. This filter will be used in position 1 of cartridge 1 when testing the new lot filters.

13) Unload the current lot filters into labeled Petri dishes. Place one of the median filters into position 1 of the first cartridge, and then fill the rest of the positions in the three cartridges with new lot filters. Repeat step six for the new lot filters.

14) Unload the cassettes (except for the median filter in position 1 of cartridge 1) and reload the cassettes with another 11 new lot filters. Repeat step six again.

For preliminary testing, if the PTFE filters are within the acceptable range for the flow change test, then the test lot is approved. After being approved, a purchase order for the approved lot should be submitted to MTL by the appropriate employee.

6.1.4   Switching PTFE Filter Lots

The exact date on which the new PTFE lot will begin to be used can be predicted using the "RATE LOG" tab described earlier in Section 6.1.2. The first filter information for the new PTFE lot should be listed on the Week 1 log sheet of any given bin. The lot will change at the start of any day, preferably at the beginning of a new cycle (2-3-2 or 3-2-2). When planning for the transition, keep in mind that it is ideal to have approximately two PTFE filter boxes from the old lot remaining at the end of a transition, so that there are enough for archiving but not too many that go unused.

Once the date for the lot change is chosen, the lab can begin preparation. The new PTFE lot needs to be swapped with the old PTFE lot in the sample handling lab when the correct bins are ready for load with the new lot. Also, remove the problem filters (dropped, specks, holes) from the lab that are from the old lot. Make new empty boxes for the defective filters. Navigate to the Web Application, and under the Home tab select the **Lots** tab. Select the lot that will be retired and add an EndDate. Once an EndDate is added to a lot the lot will be marked as inactive. Select **New Lot**. Enter the Lot Number, Manufacturer, select Default Module Configurations, and the given Start Date. Enter any comments, if

applicable and select **Create**. Once the new lot is added, the new cycle of bins can be loaded.

6.2 Nylon Filters

6.2.1 Receiving a Nylon Filter Lot

Shipments of nylon filters are sent with an invoice and a packing slip. Shipments can range from two boxes of filters to as many as three hundred boxes; each box contains one hundred nylon filters. Test lot shipments will usually contain around two boxes, while approved lot shipments will usually contain the full number of boxes used for the year (~ 300). Sometimes lot shipments are split and sent within a day or two of each other. When filters are received, count the number of boxes present in the order to verify the packing slip. Sign and date the packing slip and give it to the AQRC employee in charge of accounting.

After nylon boxes are stickered, they are sorted into re-sealable bags in groups of 4 boxes. Make sure boxes are sorted in such a way that their box numbers remain sequential. Nylon filters are then stored in the refrigerator in the general Sample Handling Lab area.

6.2.2 Nylon Filter Inventory

The nylon inventory files are located at U:\IMPROVE_Lab\Lab Gravimetric\Filter Inventory and Acceptance. There is a separate folder for each year. Within each yearly folder are separate Excel files for nylon, quartz, and PTFE filters.

Each Excel file contains numerous spreadsheets for logging in sets of boxes of filters.

These sheets are created when a shipment of filters arrives and are completed as filters are used.

There is also a "RATE LOG" sheet that keeps track of filter usage and provides an estimated depletion date for the filters on hand. The nylon files also include "LABELS" sheets that are used to create and print labels to be affixed to each box of filters.

Nylon filters come in large shipments, typically around a year's supply. A new set of log sheets and a new set of labels to affix to each box of filters are created for each shipment.

Copy the most recent Excel file for nylons and rename it with the date of receipt of the shipment. Some cutting and pasting is required to create the new file, and enough sheets must be created within the file to accommodate the size of the new shipment.

Working from right to left in each sheet, delete the entries in the "DATE" and

"INITIALS" columns, as these are completed as the filters are used. Enter the date of receipt of the shipment in the "INPUT" tab and it should update all the log and label sheets.

For the Box # column, list pack numbers consecutively starting at 1. There will be twenty pack numbers per page for nylon filters. Boxes are assigned pack numbers after labels are generated and affixed to each box, as described below. If a lot is split into two shipments, the pack number resets and the first box of shipment 2 is set as 1.

The next column to the left, "Quantity," lists the number of filters in a box. This number is typically 100 for nylons. However, several filters are removed from a few boxes for acceptance testing or other tests, so modify the numbers in the appropriate cells as necessary to reflect the actual number of filters in that box.

The spreadsheet has a **SHIPMENT** column, which is usually "1" unless the order is split and delivered in separate shipments. Find the lot number on a sticker on the filter boxes and enter it into the "Lot #" cell in the "**INPUT**" tab and all sheets should be updated. The entries in the **"REMOVAL**," "**SIZE**," and "**PART #**" column do not typically change and can usually be left untouched; however, if the "**PART #**" changes, enter the new number into the "**PART #**" cell in the "**INPUT**" tab.

A set of labels to be affixed to each box of filters is created for each shipment. Go to the "**LABELS**" sheet to do this. There may be multiple "**LABELS**" sheets to accommodate the size of the shipment. In most cases, the label sheets will already be updated with the date received and the new lot number. Cells B3 and E3 may need to be modified if it is not shipment #1. All of the other cells in the sheet are linked to these upper-left cells and populate themselves automatically. Print the label sheets onto label stock and affix a label to each box of filters.

A few selected filters from each new lot of nylon filters will need to undergo acceptance testing. Work with the laboratory manager to select these filters and to arrange for laboratory analysis.

Each Excel file contains a "**RATE LOG**" sheet. This sheet keeps track of the filter usage versus the inventory available and, based on the average rate of usage, predicts when the current lot will run out. Edit the "**RATE LOG**" sheet as needed to contain the same number of rows as the number of spreadsheets in the shipment. For multiple shipments within a spreadsheet, set the appropriate number of rows for each shipment as it comes in. Note that columns C ("**PACKAGES**") through G ("**COMPLETED**") are populated by links to individual spreadsheets. When a new "**RATE LOG**" sheet is created, review it carefully to make sure the links are pointing to the proper sheets based on the "**SHIPMENT**" and "**SET**" listed in columns A and B. Referring to the summary formulas at the bottom of the spreadsheet, the "**TOTAL**" summation should include all the rows of the table, as it shows the total beginning inventory. The "**FIL USED**" and "AVG" formulas include only the rows associated with the

filters used to date, as will be explained further below. Ignore columns to the right of column H.

The laboratory staff will complete an entry on the excel sheet each time a box of filters is checked out for use.

Once an entire log sheet has been populated proceed to the "**RATE LOG**" sheet. In cell H3, enter the date on which the log sheet was completed. Check the last completed row in the "**RATE LOG**" sheet to verify that it corresponds to the log sheet being entered (that row should have been completed by its links to the log sheet).

Then go to the formulas at the bottom of the spreadsheet. In both "**FIL USED**" and "**AVG,**" change the second cell within the formula parentheses to indicate the row of the log sheet that is being added. If just one log sheet is added, this will involve augmenting the formula by one row (for example, changing (D6:D17) to (D6:D18)).

When all of the data is entered, check the depletion date shown in yellow at the bottom of column H. This date is the estimate of when the inventory will run out based on average usage.

6.2.3 Nylon Filter Preliminary/Acceptance Testing

Consistency in flow and composition are the primary requirements for nylon filters being used in the IMPROVE network.

Precut nylon filters from Pall Corporation are purchased by UC Davis in boxes of 100 filters. Approximately 2 boxes are sent for preliminary testing. Eleven filters from each box (or a total of 22 filters) are tested for flow changes, and around five from each box (or totaling 10 filters) are sent to the ion contractors for analysis to verify that there are no abnormal artifacts. When certified, the entire lot is authorized for purchase. Acceptance testing is performed again when the filter lot is delivered before they are cleared to go out into the field. The following sections apply to the preparation and analysis of both new test lots of filters and filters that have been pre-approved. Items that apply specifically to only one or the other are noted.

6.2.3.1 Nylon Analysis

Ten nylon filters from each nylon shipment (including test lot filters for preliminary testing) are sent for analysis to the ion contractor to verify that there are no abnormal artifacts. Steps for analysis follow below.

1) Randomly select 10 or more filters apart from the ones used for the pressure tests described below.

2) Place each selected filter in a Petri dish and label the dishes "TEST0"-"TEST9."

3) Package the filters in a Petri dish box and ship them overnight to the ion contractor.

4) Receive the data and determine the average concentrations and standard deviations for each species.

5) Compare the results for the lot being tested with the results from the testing of the lot currently in use.

6) Forward the results and comparisons to the laboratory manager. If the measured concentrations for the 2 lots are within 5%, the tested blanks are lower than the analyzed lab blanks, and the standard deviation is low, then the filters are accepted for use.

7) Set aside 1 or 2 boxes from the new lot (after final acceptance testing) for archiving and for maintenance technicians' future audits.

6.2.3.2 Flow Change Test

The flow change test for nylon filters is essentially the same as the flow change test for PTFE filters, which is described in section 6.1.3.3. The only difference is that the audit cartridge is a B cartridge.

Calculate the average flow rate for the lot being tested. If flow rate shows great variability within the same lot and it is not due to a leaky cassette, the filter counts may be increased to see if the trend continues.

The information collected from this test must be sent to the laboratory manager.

If the test lot passes the flow change test and all the prior tests, then it is approved, and a purchase order can be placed for next year. If the new lot passes the flow change test and all prior tests, it is cleared for use in field operations.

6.2.4 Switching Nylon Lots

The monitoring of remaining filters from a given lot and the transition between filters is very similar to the procedures for the PTFE filters. Differences and distinctions are outlined below.

6.2.4.1 Monitoring the Depletion of Nylon Filters

Nylon filters do not have the same manufacturing problems as PTFE filters; therefore, there is no need to keep track of the percentage of rejects. Check the "RATE LOG" about once a month (more often when approaching the lot change date) to see what the estimated end date is for the current lot. The "RATE LOG" can be found in U:\IMPROVE_Lab\Lab Gravimetric\Filter Inventory and Acceptance\YYYY\YYYY_MM_DD_NYLON FIL Log.xls

6.2.4.2 Transitioning Between Lots

The procedure for the transition between nylon lots is the same as the transition between PTFE lots, as described in Section 6.1.4.

6.3 **Quartz Filters**

Quartz filters are sent from PALL Corporation to the carbon contractor, where they are pre-fired and labeled. Quartz shipments are much smaller than nylon and PTFE shipments, typically around a month's supply of filters. The packet(s) of filters should be stored in the freezer in the Sample Handling Lab.

6.3.1 Quartz Filter Inventory

The quartz filter inventory files are located at U:\IMPROVE_Lab\Lab Gravimetric\Filter Inventory and Acceptance. There is a separate folder for each year. Within each yearly folder are separate Excel files for nylon, quartz, and PTFE filters. Quartz Excel files contain spreadsheets for logging in sets of boxes of filters as well as a "RATE LOG" sheet that keeps track of filter usage.

Because of smaller shipment sizes, a single Excel file can accommodate a year's worth of quartz shipments, with the "SHIP" number designated in each spreadsheet tab. The carbon contractor ships the boxes in vacuum-sealed packets, with around a half-dozen boxes in each packet. It is most convenient to list one or two packets on a sheet, so the number of records in each sheet will vary depending on how the carbon contractor filled the packets. If fewer than the maximum 12 rows in a sheet are used, delete the formulas in column M for the unused rows, as they will not calculate correctly if left in.

Open the most recent Excel file for quartz and rename it with the date of receipt of this shipment. Working from right to left in each sheet, delete the entries in the "DATE" and "INITIALS" columns as these are completed as the filters are used. Enter the date of the receipt of the shipment in the "RECEIVED" column. Information for the next six columns ("QUANTITY" through "PRE-FIRED") is provided on a data sheet that the carbon contractor ships with the filters. In addition, the carbon contractor emails an electronic excel document. Enter this information into the spreadsheets. The entries in the "SIZE" and "FIL TYPE" columns typically do not change, so they can be left untouched.

Each Excel file contains a "RATE LOG" sheet. This sheet keeps track of the filter usage versus the inventory available and based on the average rate of usage, predicts when the current shipment will run out. Edit the "RATE LOG" sheet, as needed, to contain the same number of rows as the number of spreadsheets (common for quartz), set the appropriate number of rows for each shipment as it comes in. Note that columns C ("PACKAGES") through G ("COMPLETED") are populated by links to individual spreadsheets. When a new "RATE LOG" sheet is created, review it carefully to make sure the links are pointing to the proper sheets based on the "SHIPMENT" and "SET" listed in columns A and B.

Referring to the summary formulas at the bottom of the spreadsheet, the "TOTAL" summation should include all the rows of the table, as it shows the total beginning inventory. The "FIL USED" and "AVG" formulas include only the rows associated with the filters used to date, as will be explained further below. Ignore columns to the right of column H.

The laboratory staff will complete an entry on the excel log sheet each time a box of filters is checked out for use. Enter the *initials* and *date* into each cell on the appropriate sheet.

Once an entire log sheet has been populated proceed to the "RATE LOG" sheet. In cell H3, enter the date on which the log sheet was completed. Check the last completed row in the "RATE LOG" sheet to verify that it corresponds to the log sheet being entered (that row should have been completed by its links to the log sheet).

Next, address the formulas at the bottom of the spreadsheet. In both "FIL USED" and "AVG," change the second cell within the formula parentheses to indicate the row of the log sheet that is being added. If just 1 log sheet is added, this will involve augmenting the formula by 1 row (for example, changing (D6:D17) to (D6:D18)).

Once the data are entered, check the depletion date shown in yellow at the bottom of column H. This date is the estimate of when the inventory will run out based on average usage.

6.3.2   Switching Quartz Lots

Each box of quartz filters has a different lot number written on the top of the box. Laboratory technicians and undergraduate students must use sequential box numbers. Sometimes the carbon contractor will skip several box numbers in their numbering scheme. New entries for quartz filters are generated at Cartridge Preparation station. When a new box is opened the user updates the new **Lot** on the Cartridge Preparation screen. Do so by highlighting the lot of the first sample that will receive a filter from the new box. In **Lot #** enter the new lot. The new lot number can be found at the top of the box starting with a letter and followed by four numbers (i.e. Q9120). Ensure that the entry is correct. The **Start Date** should be prefilled with the current date and time. Select **Save**, the sequential lot numbers will be updated with the new lot number. A lead laboratory technician should be notified if any errors occurred while entering the new lot number.

7.   DATA AND RECORDS MANAGEMENT

Detailed information regarding each lot is located in the IMPROVE database and can be accessed through the Web Application: https://improve.aqrc.ucdavis.edu/Lots. Refer to UCD IMPROVE TI #251T, Section 2.1: Databases for more detailed information.

Inventory and tracking for each lot are located in the central U-Drive. All records are stored in their corresponding receiving year within the directory: U:\IMPROVE_Lab\Lab Gravimetric\Filter Inventory and Acceptance.

8. QUALITY ASSURANCE AND QUALITY CONTROL

Filter depletion rate is closely monitored by lab staff to ensure there are plenty of filters on hand, and to determine when a new order needs to be placed. Lot numbers are monitored closely and updated by the lab staff to ensure FilterIDs have the correct **Lot#** assigned before deployment for sampling.